

**National Exposure Research Laboratory
Research Abstract**

GPRA Goal 2 - (Clean and Safe Water)
FY 2004 Annual Performance Measure (APM) #255

Significant Research Findings:

**Prototype indicators of condition for deep
river fish assemblages developed
Electrofishing in Boatable Rivers:
Does Sampling Design Affect Bioassessment Metrics?****Scientific
Problem and
Policy Issues**

Fish assemblages are among the indicators frequently used in the bioassessment of surface waters. Correlations have been successfully demonstrated between fish indices of biotic integrity (IBIs) and human activities that influence streams and rivers. Although IBIs have been widely applied in wadeable streams and are slowly gaining popularity for the assessment of large rivers, their application in large rivers has been relatively limited. Electrofishing is commonly used to collect fish for bioassessments because it is widely considered to be the single most comprehensive and effective method for collecting fishes in streams and rivers. Although a wide variety of field electrofishing designs are currently in use, studies that compare these designs are limited. This study was undertaken to: 1) compare commonly used boat-based electrofishing designs; 2) determine the sampling distance at which the values of common bioassessment metrics begin to stabilize; and 3) study the influence of physical site characteristics on the designs. The primary goal of this study was to provide an analysis of electrofishing designs that will enable agencies or individuals charged with bioassessment and monitoring of boatable waters to select the best electrofishing designs relevant to the needs of each study. A second goal of the study is to support the development of a Large River Bioassessment Protocol (LR-BP) for bioassessment and monitoring activities.

**Research
Approach**

Data were collected from 60 boatable sites using an electrofishing design that permitted comparisons of the effects of designs and distances on fish assemblage metrics. Sites were classified a priori as Run-of-the-River (ROR) or Restricted Flow (RF). Data representing four different design options (i.e., 1000 and 2000 m for both single and paired banks) were extracted from the dataset and analyzed.

**Results and
Impact**

This research detected significant differences in many common measures of fish assemblage condition as a result of field design. To further the development of a standardized design with known performance, the percent change in assemblage measures (metrics) was plotted against cumulative electrofishing distance. The percent change in the metrics was found to decline sharply when electrofishing covered a distance of approximately 1000 m, after which metrics usually varied by less than 10 percent. These results demonstrate that electrofishing designs that

cover distances of 1000 m of shoreline are sufficient for bioassessments on boatable rivers (assuming the river is similar to those in this study), regardless of whether the shoreline is along a single bank or distributed equally among paired banks. However, at sites with depths > 4 m (where electrofishing can be less representative), nighttime electrofishing (which is more effective in deeper waters) or daytime electrofishing designs to cover 2000 m may be advisable to obtain more representative samples.

With development of this standardized method, regulatory agencies have a new tool for determining the condition of large rivers, an integral part of achieving water quality for all surface waters. The method has been adopted, and is in-use, as the standard method used by the Huntington District of the U.S. Army Corps of Engineers for bioassessment of waters within their jurisdiction, and by the state of Kentucky as their standard method for conducting state-wide assessments. Additional applications of the method are pending for 2005.

**Research
Collaboration and
Research
Products**

Research Team: Joseph E. Flotemersch and Karen Blocksom, National Exposure Research Laboratory, U.S. Environmental Protection Agency, 26 W. Martin Luther King Dr., Cincinnati, OH 45268 USA.

For a listing of recent publication, presentation, and workshops on this and related research, please consult the contact information below.

Future Research

Using the field design that resulted from this research, data is being collected to compare the effects of different electrofishing configurations on measures of fish condition in large rivers. Information gained from this study will be used to standardize data sets collected using different electrofishing configurations in efforts to examine fish condition at large scales (e.g., basin-wide, regional, national).

**Contacts for
Additional
Information**

Questions and inquiries can be directed to:
Joseph E. Flotemersch, Ph.D.
US EPA
National Exposure Research Laboratory
Cincinnati, Ohio 45268
Phone: 513/569-7086
E-mail: flotemersch.joseph@epamail.epa.gov